lime (chemical compound)

Lime, quicklime, and burnt lime are the common names for calcium oxide, CaO, a grayish-white powder. The manufacture of over 150 important industrial chemicals requires the use of lime. In fact only five other raw materials (salt, coal, sulfur, air, and water) are used in greater amounts. Lime is used in glass, cement, brick, and other building materials; in the manufacture of steel, aluminum, and magnesium; in poultry feed; and in the processing of cane and sugar beet juices. Lime is strongly caustic and can severely irritate human skin and mucous membranes.

See also: CALCIUM.

sinter

Sinter, a porous mineral deposit usually formed in thermal waters, may be composed of either opaline silica or calcium carbonate. Silica-rich sinter (geyserite) is deposited largely through the action of algae and occurs as crusts near hot springs and geysers, sometimes forming conical mounds or terraces.

TRAVERTINE and other calcareous sinter (sometimes called tufa) is precipitated in thermal waters by mosses and other organic matter. Common in limestone districts, travertine was the principal building stone of ancient Rome.

brick and bricklaying

Building bricks are masonry units made of clay and hardened by heat or chemical action. Sun-dried, or ADOBE, bricks are a mixture of clay and vegetable fibers; kiln-burned bricks are made from clays and are formed in a mold and fired in a kiln (oven) to hardness. Sand-lime bricks are a mixture of sand and lime that has been hardened under steam pressure. Concrete bricks are composed of portland cement and aggregate. The most commonly used type is kiln-burned brick.

HISTORY

In the Babylonian civilization (c.3500 BC) that developed in the valley of the Tigris and Euphrates rivers, the thick clay and mud deposited by the rivers was well suited for making bricks. Immense pyramids (see ZIGGURAT) were constructed of sun-dried brick faced with kiln-burned glazed brick of many colors. The bricks were held together with bitumens (naturally occurring tars). The Romans made wide use of kiln-burned brick in conjunction with an efficient mortar of lime and volcanic ash (pozzuolana). As the Roman Empire declined, the art of brickmaking disappeared in most of Europe and was revived only in the late Middle Ages, influenced by the Italian and Byzantine artisans who had kept the technology alive.

In the earliest method of brickmaking, clay was pulverized, mixed with water to form a stiff paste, and pressed into molds by hand. The bricks were then turned out of the molds and dried in the sun. The kiln consisted of a series of arches made from the naturally dried brick. More dried brick was piled atop the arches in a checkerboard pattern to form a beehive-shaped mound, and a fire was built under the arches. Because the heat of the fire was uneven, the bricks closest to the fire burned to a shining surface that was almost black. These occasionally warped bricks, called clinkers, were used for special architectural effects. Bricks on the outer shell of the mound fired to a lighter color and were called salmon brick.

MANUFACTURING

Most brick produced in the United States is made by the stiff-mud process, using mixtures of surface clays and shales. In the soft-mud process, a much wetter clay is pressed into molds or extruded, rather than sliced from a brick-sized column of clay. In the dry-press process high pressure is used to compress a fairly dry clay in a mold and is then used to manufacture refractory masonry, such as FIREBRICK.

Modern kilns are permanent enclosures with the heat usually generated by external ovens. The heated air is circulated through the bricks stacked in the kiln to produce a fairly uniform masonry unit. Kilns are classed as intermittent or continuous. In the intermittent kiln, the brick must be piled, fired, cooled, and the bricks removed before new dried brick is piled to be fired. The continuous, or tunnel, kiln consists of a tunnel with several zones in which the temperature is carefully controlled. The moist clay formed by machines is loaded onto special cars that are drawn through the kiln at a constant rate of speed. The bricks are successively shaped, dried, fired, and cooled to produce a uniform product.

The most widely used brick is called common brick. Its color will vary from a dark orange to a yellow or deep red, depending on the type of clay used. Face brick is manufactured to close tolerances in size, structural qualities, color, and finish. It is sometimes glazed and used as a facing on exposed wall surfaces. Firebrick is used for lining fireplaces and furnaces; it is beige to light brown in color and is weaker than common brick.

BRICKWORK

Brickwork is designed so that individual bricks are bonded into a structure that will act as a whole. The texture, strength, and watertightness of a brick wall depend greatly on the skill of the bricklayer. Mortar joints between individual bricks must be well formed and watertight. The mortar used to hold the bricks together consists usually of portland cement, lime, and sand, although mortar types vary throughout the world.

The "bond" of a brick wall is the arrangement of bricks in rows or courses. The type of bond used will determine the appearance of a wall. Bonds tie 2 or 3 tiers of brick together or they tie an outer brick facing to an inner backup wall.

Steel reinforcing bars increase the shearing and bending strength of a load-bearing brick wall. The steel bars may be placed in the mortar joints between bricks or in a double wall in the cavity between outer and inner walls. The cavity may be left as a dead-air space to provide for evaporation of moisture from the walls, or it is sometimes filled

Mold and Slip Casting

Slip casting is a technique where a mixture of clay and liquid is poured into a mold. The mold is usually made of plaster of Paris, which absorbs the liquid from the slip, leaving behind a solid layer of clay. This method is commonly used for creating hollow ceramic objects, such as vases or figurines. The mold can be reused multiple times, making it an efficient way to produce identical pieces.

Kiln

A kiln is a specialized oven used for firing ceramics. It reaches high temperatures, typically between 1,000°C and 1,300°C, depending on the type of clay and glaze being used. The firing process transforms the soft, porous clay into a hard, durable material. Different types of kilns exist, including electric kilns, gas kilns, and wood-fired kilns, each with its own advantages and disadvantages.

Glazing

Glazing is the process of applying a glass-like coating to the surface of ceramic ware before firing. This coating can be clear or colored, and it can be applied in various ways, such as dipping, brushing, or spraying. The glaze not only adds decorative qualities but also makes the ceramic piece more durable and resistant to water and stains.

Wheel-Thrown Pottery

Wheel-thrown pottery is created using a potter's wheel, a machine that rotates the clay while the potter shapes it with their hands and tools. This technique allows for the creation of symmetrical and uniform pieces, such as bowls, plates, and cylindrical vessels. The potter's wheel has been used for thousands of years and remains a popular method for producing ceramics today.

Hand-Building Techniques

Hand-building techniques include pinching, coiling, and slab construction. These methods involve shaping the clay by hand without the use of a wheel. Pinching is the simplest technique, where the potter forms the clay by squeezing it between their fingers. Coiling involves rolling out long ropes of clay and stacking them to build up the walls of the piece. Slab construction uses flat sheets of clay that are cut and joined together to create structures like boxes or tiles.

Sculptural Ceramics

Sculptural ceramics are three-dimensional works of art made from clay. Unlike functional pottery, sculptural ceramics are not intended for practical use but rather for aesthetic appreciation. Artists may use various techniques, including hand-building, wheel-throwing, and mixed media, to create their sculptures. The versatility of clay allows for a wide range of expressions, from abstract forms to realistic figures.

Raku Firing

Raku firing is a traditional Japanese technique that involves removing pottery from the kiln while it is still red-hot and placing it in combustible materials, such as sawdust or leaves. This process creates unique, unpredictable patterns and colors on the surface of the ceramic. Raku firing is known for its dramatic results and the element of surprise, as the final appearance of the piece is often not fully revealed until after the firing is complete.

Terra Sigillata

Terra sigillata is a fine, smooth clay slip that is applied to the surface of pottery before firing. It is made from refined clay particles and water, and it can be colored with natural pigments. Terra sigillata was commonly used in ancient Roman pottery and is known for its glossy finish and ability to create detailed surface decorations.

Porcelain

Porcelain is a type of ceramic that is known for its strength, translucency, and white color. It is made from a mixture of kaolin, feldspar, and quartz, which are fired at very high temperatures. Porcelain is highly valued for its delicate appearance and is often used for fine tableware and decorative objects.

with grout, a mortar of pouring consistency.

New methods were developed in the 1970s for producing prefabricated reinforced brick masonry panels. Masonry panels as large as 2.4 x 6.1 m (8 x 20 ft) are fabricated in specially equipped shops and transported to the job site for erection. The steel-reinforced brick panels are hoisted into position by cranes and welded or bolted to the structural frame.

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